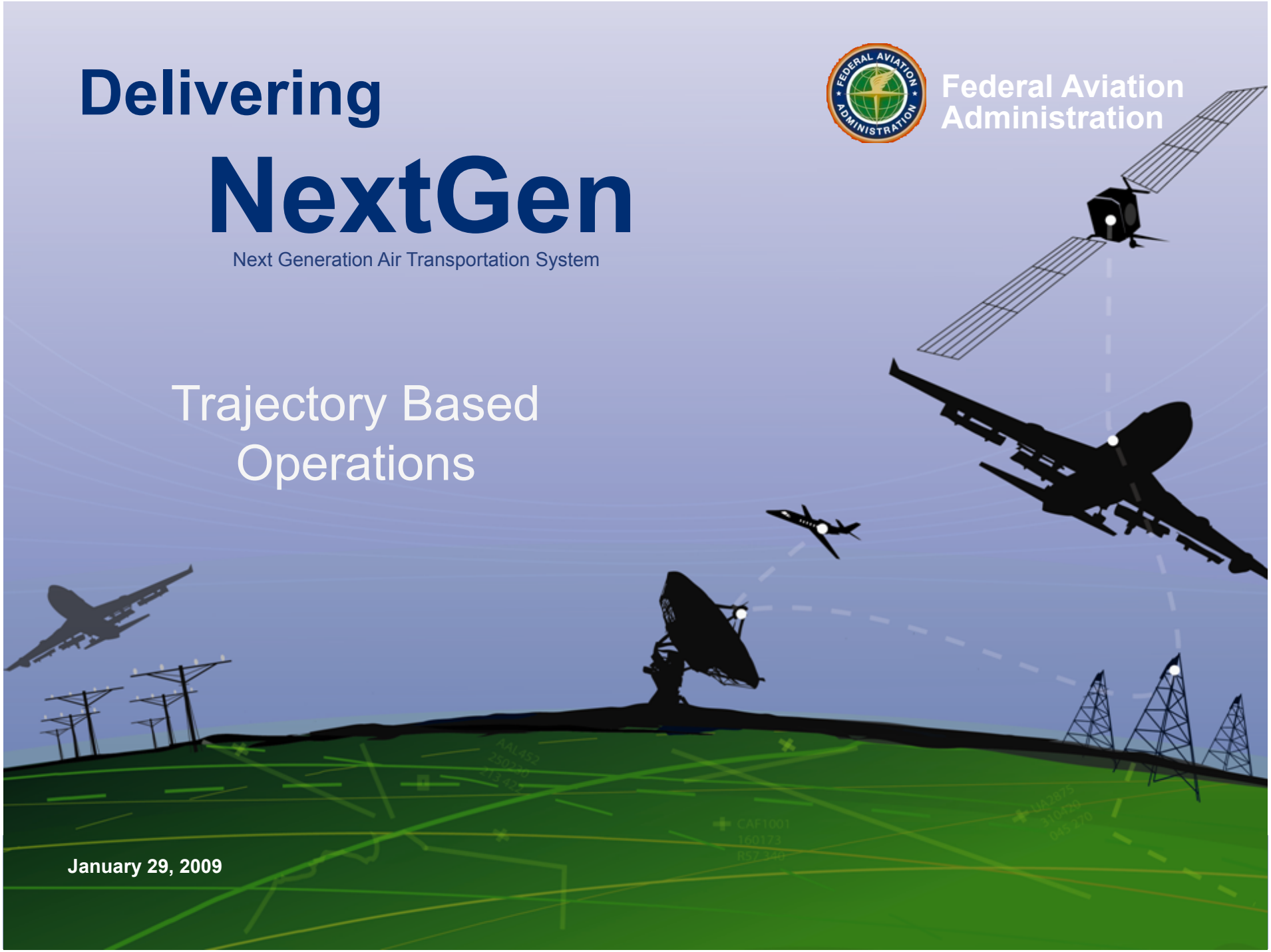
Delivering NextGen

Next Generation Air Transportation System

Federal Aviation Administration

Trajectory Based Operations



January 29, 2009

NextGen Mid-Term
Trajectory Based Operations

Definition

Trajectory Based Operations represent a shift from clearance based to trajectory base control. Aircraft will fly negotiated trajectories and air traffic control moves to trajectory management. The roles of pilots/controllers will evolve due to the increase in automation support. The focus of TBO is primarily en route cruise.

Capabilities

Delegated Responsibility for Separation [102118]

Oceanic In-trail Climb and Descent [102108]

Automation Support for Mixed Environment [102137]

Initial Conflict Resolution Advisories [102137]

Flexible Entry Times for Oceanic Tracks [104102]

Point in Space Metering [104120]

Increase Capacity and Efficiency Using RNAV and RNP [108209]

Provide Interactive Flight Planning from Anywhere [101103]

Operational Objectives

- Safe and Efficient Separation Management
- Management of Trajectories

FY09 Activities

1A09A Modern Procedures - Separation Automation Enhancement (D and R Sides)

1A09B High Altitude Specialty

1A09CEn Route Point In Space Metering

1A09D Oceanic

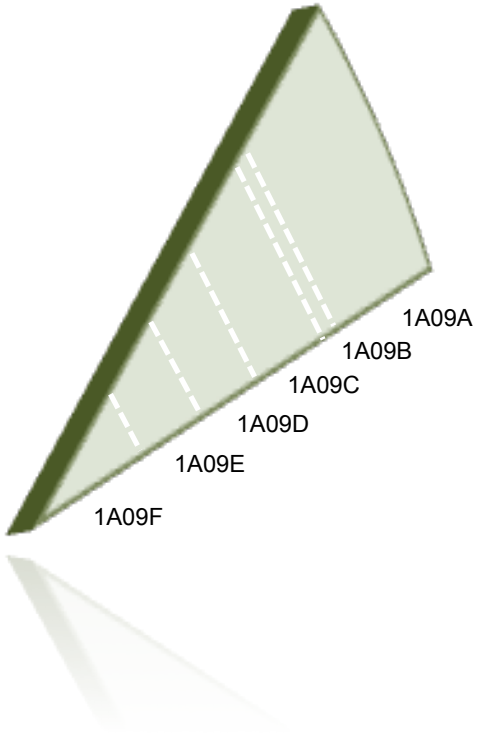
1A09E Flight Objective

1A09F NextGen Distance Measuring Equipment

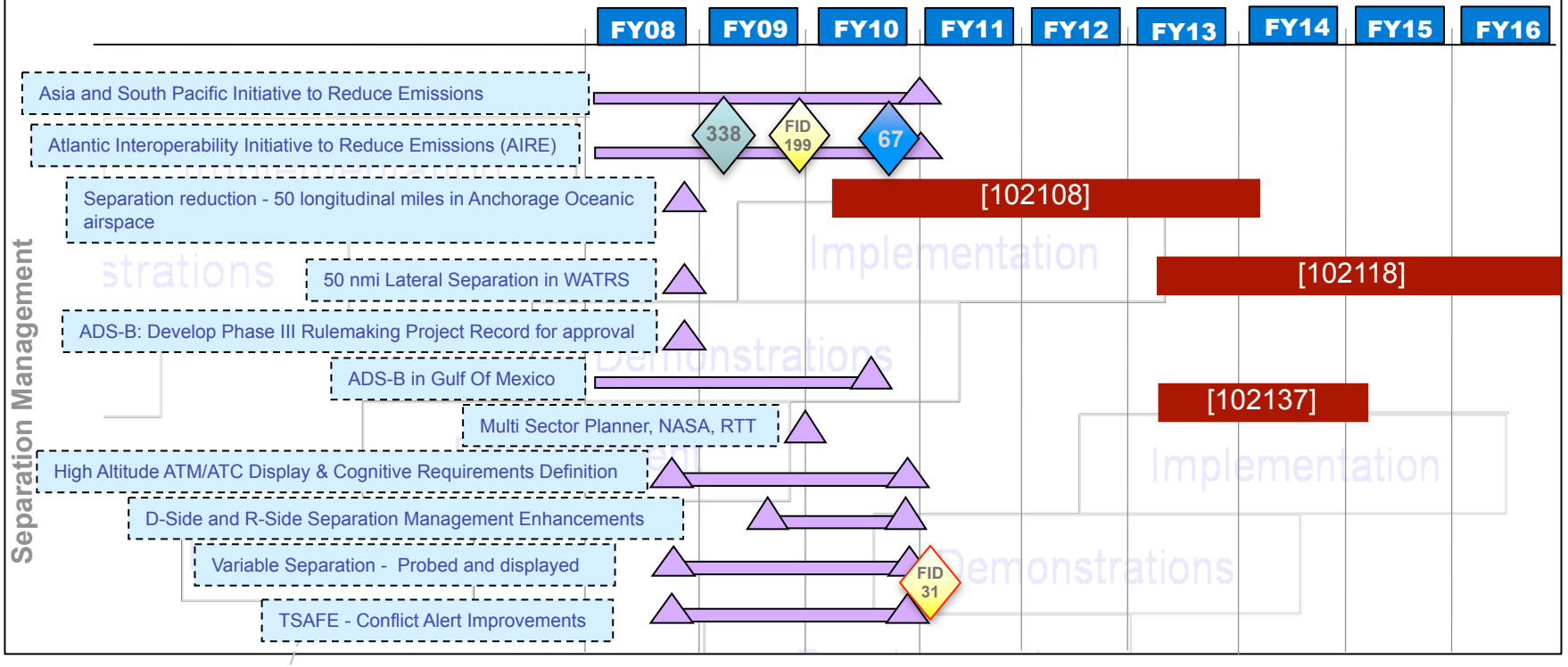
1A07A International Air Traffic Interoperability (Demo Funding)

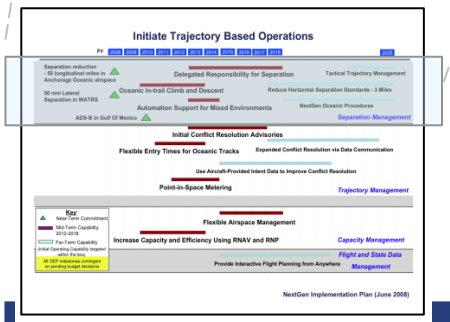
1A08F Wake Turbulence – Re Categorization (Systems Funding)

Funding



Initiate TBO Mid Term
Automation Roadmap to Improvements





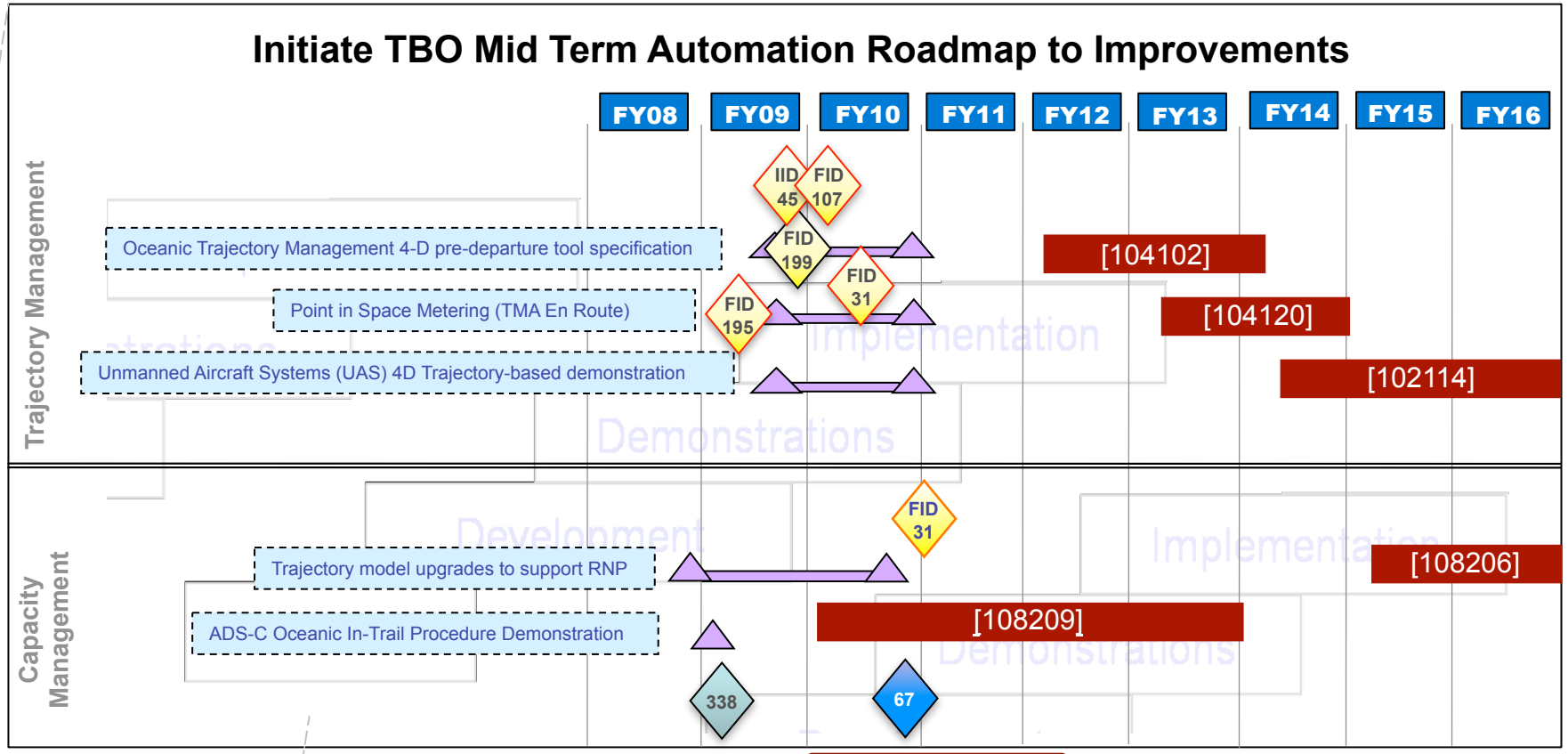
Capability Description

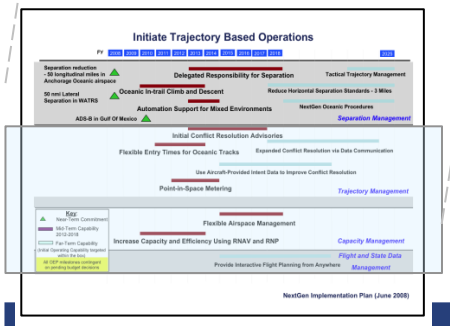
102108 - Oceanic In-trail Climb and Descent – ANSP automation enhancements will take advantage of improved communication, navigation, and surveillance coverage in the oceanic domain. When authorized by the controller, pilots of equipped aircraft use established procedures for climbs and descents.

102118 – Delegated Responsibility for Separation – Enhanced surveillance and new procedures enable the ANSP to delegate aircraft-to-aircraft separation. Improved display avionics and broadcast positional data provide detailed traffic situation awareness to the flight deck. When authorized by the controller, pilots will implement delegated separation between equipment aircraft using established procedures.

102137 – Automation Support for Mixed Environments – The ANSP automation provides the controller with tools to manage aircraft in a mixed navigation and wake performance environment.

Initiate TBO Mid Term Automation Roadmap to Improvements





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Capability Description

104102 - Flexible Entry Times for Oceanic Tracks – Flexible entry times into oceanic tracks or flows will allow greater use of user-preferred trajectories.

108206 - Flexible Airspace Management – ANSP automation supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities.

104120 – Point in Space Metering – ANSP uses scheduling tools and trajectory-based operations to assure a smooth flow of traffic and increase the efficient use of airspace.

108209 – Increase Capacity and Efficiency Using RNAV and RNP - Both Area Navigation (RNAV) and Required Navigational Performance (RNP) enable more efficient aircraft trajectories. RNAV and RNP combined with airspace changes, increase airspace efficiency and capacity.

102114 – Initial Conflict Resolution Advisories – The ANSP conflict probe is enhanced to not only recognize conflicts but to provide rank-ordered resolution advisories to the provider, who may select one of the resolutions to issue to the aircraft. Automation enables ANSP to better accommodate pilot requests for trajectory changes by providing conflict detection, trial flight planning, and development of resolutions and an optimal ranking of resolutions.

NextGen Mid-Term
Relevant EA Decisions

Trajectory Based Operations

Decision Point (DP#)	Automation Decision Point Description	Target Dates
31	Investment Decision on Post ERAM R3 Work Package	2010
45	Terminal Automation Modernization and Replace (TAMR) Phase 3 Initial Investment Decision	2009
67	Approval of Offshore Implementation Long Term Plan	2010
107	TAMR Phase 3, FID	2010
195	Time Based Flow Management (TBFM), FID	2009
199	DOTS Sustainment/Integration Decision	2009
338	ATOP NG	2009

NextGen Mid-Term
Trajectory Based Operations

BLI -1A09A

Separation Management – Modern Procedures
Separation Automation Enhancements, D-Side and R-Side

FY09 Milestones	Q1	Q2	Q3	Q4
Conduct Engineering Analysis to Assess the Enhancement to the Conflict Alert and Conflict Probe Functionalities for En Route Automation Modernization				
Conduct Computer Human Interface Assessment of Changes to the D-Side Workstation to Support Functionalities for En Route Automation Modernization				
Engineering Analysis and Develop Prototype of the D-Side Workstation to Support Functionalities for En Route Automation Modernization				
Systems Engineering: ConOps, Requirements, HITL, Benefit Assessments, Algorithm Evaluation and Requirements				
Develop Standard Test Scenarios for Testing and Evaluation of the Enhanced Conflict Alert and Conflict Probe Functionalities for En Route Automation Modernization				

NextGen Mid-Term
Trajectory Based Operations

BLI -1A09B

Separation Management – High Altitude

FY09 Milestones	Q1	Q2	Q3	Q4
Conduct Airspace Design Analysis , Identify Informational, Operational and System Requirements				

NextGen Mid-Term
Trajectory Based Operations

BLI -1A09C

Trajectory Management –
En Route Point-in-Space Metering

FY09 Milestones	Q1	Q2	Q3	Q4
Complete Initial TBFM Acquisition Schedule and Initial Market Survey				
Complete TBFM Requirements Documentation				
Complete TBFM OMB -300 and FID Documentation				
Conduct Preliminary TMA/ERAM Analysis – Identify Gaps and Similarities				
TBFM Concept Engineering Plan				

NextGen Mid-Term
Trajectory Based Operations

BLI -1A09D

Trajectory Management – Oceanic

FY09 Milestones	Q1	Q2	Q3	Q4
Develop Initial Mid-Term In-Flight OTM- 4D Research and Development Roadmap to NextGen Capabilities				

NextGen Mid-Term
Trajectory Based Operations

BLI -1A09E

Flight and State Data Management – Flight Objective

FY09 Milestones	Q1	Q2	Q3	Q4
ICAO Flight Plan 2012 System Impact Inventory				
Concept of Use for Flight Objective				
Findings from IFDO Proof-of-Concept Demo Results				

BLI -1A09F

Capacity Management – NextGen Distance Measuring Equipment

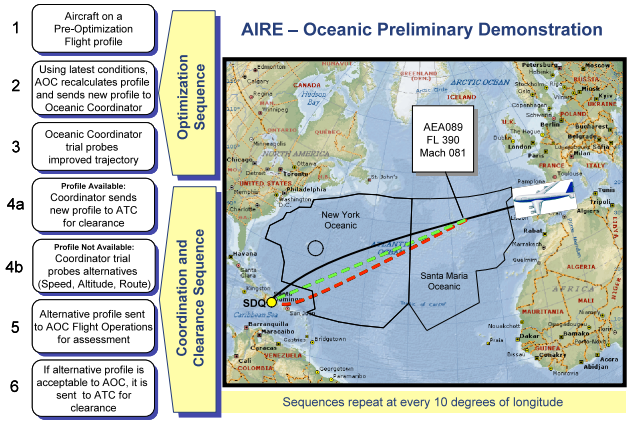
Oceanic Trajectory Based Operations

Description of Project:

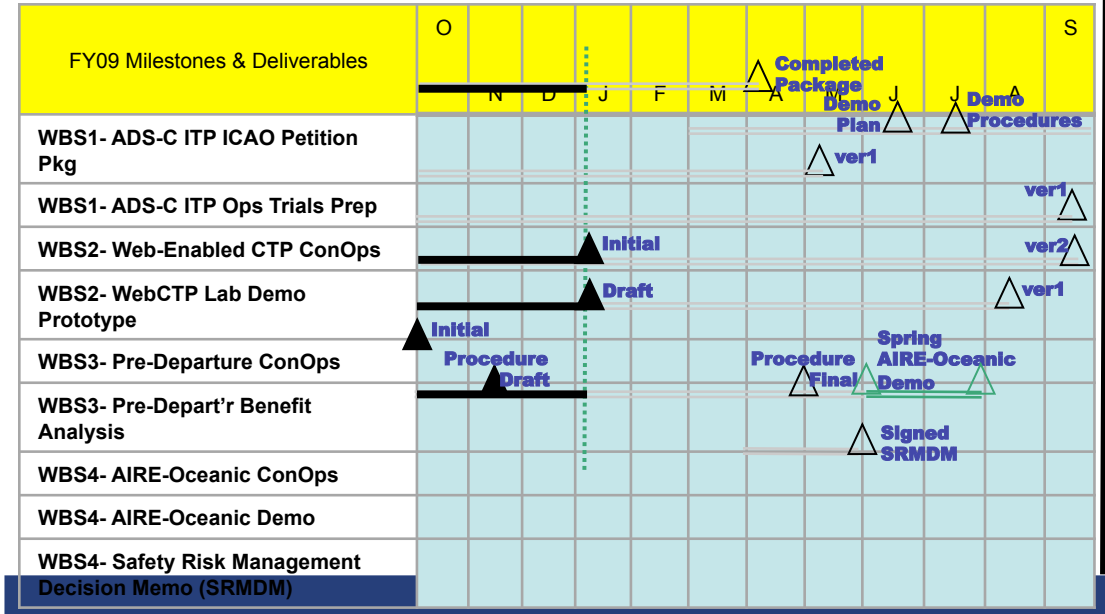
• Demonstrate potential benefits for oceanic trajectory optimization in terms of fuel savings and emissions reductions (AIRE-Oceanic demonstration) through partnerships and collaboration with the European Commission, ANSPs, airlines and other government agencies

• Increase safety, capacity, productivity, and efficiency by improving operational procedures and strategic planning in an oceanic environment

• Optimize oceanic trajectories by using existing technologies, methodologies, tools, and best practices to assist in seamless end-to-end oceanic traffic flow



Schedule/Critical Milestones



Recent Activities

- FY09 Oceanic TBO Program Plan
  - Draft delivered on 11/30/08
- WBS1- ADS-C In Trail Procedures (ITP)
  - ADS-C ITP for Ops Trials in Oceanic Airspace submitted on 10/31/08
  - ADS-C ITP Hazardous Analysis submitted on 12/31/08
- WBS2- Web-Enabled Collaborative Trajectory Planning
  - Web-Enabled CTP Preliminary Enhancement Report submitted 12/31/08
  - Project timeline being adjusted to accommodate delays in DOTS+ Online field deployment
- WBS3- Pre-Departure Oceanic Trajectory Management (OTM)-4D
  - Initial Pre-departure OTM-4D Concept of Operations delivered on 12/31/08
  - Draft Pre-departure OTM-4D High-fidelity Benefit Analysis delivered on 12/31/08
  - Pre-departure OTM-4D Preliminary Report delivered on 12/31/08
- WBS4- In-Flight OTM-4D
  - Initial Mid-Term OTM-4D In-Flight ConOps submitted 09/30/08
  - Initial FY09 AIRE-Oceanic Demo Procedures submitted

Accomplishments

- WBS4- Initial AIRE-Oceanic Demonstration completed May 2008
  - AIRE-Oceanic Demo Procedures completed May 2008
  - SRMDM completed May 2008
  - AIRE-Oceanic demos conducted during 2-week period in May 2008
  - Preliminary demo results provided by Air Europa in June 2008
  - Analyzed data received from Air Europa, New York, and Santa Maria Centers
- WBS4- Initial Mid-Term OTM-4D In-Flight Concept of Operations completed on 09/30/08

Next Two Weeks

- Finalize FY09 Oceanic TBO Program Plan
- Continue to improve on Oceanic TBO 5-year Strategic Plan